

REMARKS

This Amendment is submitted in response to the Office Action mailed August 19, 2003, wherein the Drawings were objected to under 37 C.F.R. §1.83(a) as not showing every feature of the claimed invention, Claim 17 was rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,396,397 to McClanahan, *et al.* ("McClanahan") Claims 17 – 34 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,170,154 to Swarup ("Swarup"), and Claims 17, 27, 30, 33, and 34 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,157,589 to Cole, *et al.* ("Cole"). In response, Claim 17, Specification and Drawings have been amended. In addition, Claims 17 and 18 have been amended to correct typographical errors. Applicants respectfully submit that no new matter has been entered by the amendments. Claims 1 – 16 and 35 were previously withdrawn from further consideration. **Claims 17-34 are pending.**

OBJECTION TO THE DRAWINGS

The Examiner has objected to the Drawings under 37 C.F.R. §1.83(a) for not showing features of Claim 25. In response, the Drawings have been amended with the presentation of a new Figure (Fig. 15) and a corresponding description on pages 5 and 7 of the Specification is presented herein. No new matter has been introduced in the Drawings or Specification.

Support for Figure 15 and the Specification amendment showing and describing cavities on two sides of a substrate with integrated circuit components therein are found in the patent application, specifically in Claim 25, Figs. 13 and 14, and in the Specification. Specifically, the beginning of the second paragraph on page 7 of the Specification recites: "[t]he metal layers 14 and 16 may be appropriately patterned with any suitable photoresist to respectively, selectively expose substrate surfaces 12a and 12b." In reference to FIG. 12, at page 7, lines 4 and 5 of the third paragraph, the specification states on "[i]n another embodiment of the present invention one or both of the substrate surfaces 12a and 12b may have a cavity, generally illustrated as 24 in Fig. 12. The cavity 24 may be formed by any suitable means, such as by milling, cutting or drilling." Furthermore, the Specification describes each cavity as having one or more integrated

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circuits, as described in reference to Fig. 13, and in Fig. 14, which was presented in Amendment "A" and is supported by the original patent application as described therein.

Figure 15 includes a core substrate 20 having a cavity 24a in substrate surface 12a and a cavity 24b in substrate surface 12b, and thus shows "said exposed portion of said second substrate surface includes a cavity" of Claim 25. Applicants respectfully submit that the new Figure 15 and the corresponding amendment to the Specification show the claimed features of Claim 25, and request that the Examiner reconsider and withdraw the objection to the Drawings under 37 C.F.R. §1.83(a).

REJECTION TO THE CLAIMS

Rejection of Claim 17 under 35 U.S.C. §102

Claim 17 was rejected under 35 U.S.C. §102(b) as being anticipated by McClanahan. In response, Claim 17 has been amended to more clearly distinguish the claimed invention over the prior art. Applicants believe that Claim 17 is in condition for allowance.

Claim 17 has been amended to recite "an adhesive securing said first integrated electronic component and said first substrate," and the circuit board substrate "comprising the core of said multi-layer printed circuit board." Support for these amendments are found in the original Specification at lines 7 and 8 of the first paragraph of page 8, which recites: "[e]ach integrated circuit component **20** may be secured to a desired location by any suitable adhesive." The use of the substrate as part of the core of a multi-layer printed circuit board is found in the first paragraph of page 7. Claim 17 is thus directed to a multi-layer printed circuit board having an embedded prefabricated components held in place with an adhesive.

In this rejection of Claim 17, the Examiner has noted that McClanahan indicates that the metallization layers may be electronic components. Specifically, McClanahan does state that "[t]he metallizations ... *can* form electrical components such as resistors, capacitors, and inductors are compatible with the process used to fabricate the unitized multilayer circuit structure." (col. 4, lines 48-51, emphasis added). However, McClanahan clearly describes a metallization process where the metallic layers, which are formed during the manufacturing of

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the multi-layer circuit board, act as electrical components. There is no teaching or suggestion of using an adhesive to secure the components of McClanahan to the printed circuit board.

In summary, the invention of Claim 17, as amended, is directed to and recites an adhesive which is a structure for the incorporation of prefabricated electronic components into a circuit board, while McClanahan teaches the formation of individual components, such as a resistor, a capacitor or an inductor, during the build-up of layers of a multi-layer circuit board. McClanahan thus does not teach each and every recitation of the claimed invention, and specifically does not teach an adhesive for securing an integrated electronic component to a circuit board. In addition, it would not have been obvious to modify McClanahan to obtain the claimed invention, as the components of McClanahan are formed in the printed circuit board manufacturing process. Since McClanahan fails to teach or make obvious the claimed invention, Applicants respectfully request that the rejection of Claim 17, as amended, be withdrawn.

Rejection of Claims 17-34 under 35 U.S.C. §102

Claims 17-34 were rejected under 35 U.S.C. §102(e) as being anticipated by Swarup. In response, independent Claim 17 has been amended to distinguish the claimed invention over the prior art, as described previously. Applicants believe that Claim 17, as amended, and dependent claims 18 – 34 are in condition for allowance.

Swarup describes the assembly of a multi-layer circuit board that may include individual components, specifically capacitors and inductors, formed from conducting circuit board layers. In contrast, independent Claim 17, as amended, describes an adhesive to attach prefabricated electronic components to printed circuit boards. The integration of prefabricated electronic components with an adhesive is not described or suggested in Swarup, and thus Swarup does not teach each and every recitation of the claimed invention. In addition, it would not have been obvious to modify Swarup to obtain the claimed invention, as Swarup teaches the formation of individual components within the board, and not the use of an adhesive to integrate prefabricated components into the board. Since Swarup fails to teach or make obvious the claimed invention, Applicants respectfully request the Examiner withdraw the rejection of independent claim 17, as amended, and of dependent Claims 18-34, as being anticipated by Swarup.

Rejection of Claims 17, 27, 30, 33, and 34 under 35 U.S.C. §102

Claims 17, 27, 30, 33, and 34 were rejected under 35 U.S.C. §102(b) as being anticipated by Cole. In response, independent Claim 17 has been amended to distinguish the claimed invention over the prior art. Applicants believe that Claim 17, as amended, and dependent claims 27, 30, 33, and 34 are in condition for allowance.

Cole is directed specifically to the manufacturing of "high density interconnect" (HDI) structures for interconnecting electronic components (see the FIELD OF THE INVENTION). As described in the BACKGROUND INFORMATION of Cole, HDI structures include many encapsulated chips on a substrate and have insulating and conducting layers to provide chip-to-chip interconnections. Thus, for example, HDI structures may include 30-50 chips in a two-inch square substrate. Cole teaches that this structure increases the chip density and replaces the function of printed circuit boards for chip interconnects. In addition, Cole teaches the desirability of HDI structures over printed circuit boards (col. 2, lines 54-62). There is no teaching or suggestion in Cole of mounting additional chips or other electronic components on the outer portion of the HDI.

In contrast, independent Claim 17, as amended, recites the circuit board substrate as comprising the core of a multi-layer printed circuit board. Printed circuit boards, as is well-known in the art, are typically planar structures that electrically interconnect and mechanically support electronic components. This is supported by dictionary definitions, for example: "[a] composite of organic and inorganic material with external and internal wiring allowing electronic components to be mechanically supported and electrically connected," (Microelectronics Packaging Handbook, Tummala and Rymaszewski, 1989, p 1148), and "a flat, multi-layered insulating material on which electrical components are mounted and interconnected by etched copper foil so patterned to form a circuit" (The IEEE Standard Definition of Electrical and Electronic Terms, Sixth Edition). Thus a multi-layer printed circuit board is *adapted for mounting electrical components*. As claimed, the elements of Claim 17 form the core of a printed circuit board, which inherently provides for the attachment of other components.

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Cole thus does not teach each and every recitation of the claimed invention, and specifically teaches away from a printed circuit board. Cole teaches the advantages of HDI structures over printed circuit boards, and thus it would not have been obvious to modify Cole to obtain the claimed invention. Since Cole fails to teach or make obvious the claimed invention, Applicants respectfully request that the rejection of Claim 17, as amended, and Claims 27, 30, 33, and 34 be withdrawn.

In view of the remarks made above, applicants respectfully submit that the application is in condition for allowance and action to that end is respectfully solicited. If the Examiner should feel that a telephone interview would be productive in resolving issues in the case, he is invited to telephone the undersigned at the number listed below.

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Respectfully submitted,



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